CLAIMS

What we claim is as follows:

1. An energy management system comprising:

   computer-based monitoring for an adverse energy event in a building system;

   computer-based recognition of an adverse energy event in the building system;

   immediate automatic querying of energy users within the building system for energy curtailment possibilities;

   automatic receipt of responses from queried energy users with energy curtailment possibilities;

   automatic processing of energy curtailment possibilities into a round-robin curtailment rotation.

2. The system of claim 1, wherein the adverse energy event is selected from the group consisting of a new peak demand; a human-given directive to curtail a certain amount of energy consumption; and an excess increase of energy price in a deregulated market.

3. The system of claim 1, wherein the monitoring occurs in a context selected from a business-as-usual context; 24x7 permanent load reduction context; and an emergency context.

4. The system of claim 1, including 24x7 permanent load reduction.

5. The system of claim 1, including minimization of energy consumption in ongoing business-as-usual energy consumption.

6. The system of claim 1, wherein the building system is selected from the group consisting of a single building and at least two buildings.

7. A system of claim 1, wherein the adverse energy event is a surge or a steady increase towards a new peak demand.

8. A system of claim 1, wherein the system comprises at least two buildings.

9. A system of claim 1, wherein the system comprises load balancing between buildings.

10. The system of claim 1, wherein served by the system is a building or are buildings selected from the group consisting of at least one university building; at least one hotel building; at

least one hospital building; at least one car dealership building; at least one shopping mall; at lease one government building; at least one chemical processing plant; at least one manufacturing facility; and any combination thereof of buildings.

11. The system of claim 1, wherein at least two buildings are under management and are geographically dispersed.

12. The system of claim 1, wherein a human operator is not needed.

13. The system of claim 12, wherein a human operator has an optional override right.

14. The system of claim 1, including at least two buildings, said buildings being commonly owned or not commonly owned.

15. The system of claim 1, including automatic documentation of energy savings attributable to any automatic intervention(s) by the energy management system.

16. A method for minimizing and/or eliminating need for human operator attention in energy management of a building system, comprising:

non-human, computerized processing of obtained energy data, wherein the obtained energy data is for at least one energy user in the building system,

said processing including (A) automatic determination of whether at least one energy-relevant event is present or (B) continual optimization of a setting of the at least one energy user.

17. The method of claim 16, wherein the energy-relevant event is a threat of a new maximum peak.

18. The method of claim 17, wherein the peak is selected from the group consisting of a kW demand peak, a lighting peak, a carbon dioxide peak and a pollutant peak.

19. The method of claim 16, including, when a energy-relevant event is automatically determined to be present, immediately activating an automatic response to the energy-relevant event.

20. The method of claim 19, wherein the automatic response is non-determinative.

21. The method of claim 17, wherein at least one intelligent agent, from the obtained energy data, actually forecasts the peak.

22. The method of claim 19, wherein the energy-relevant event is a threat of a new maximum peak, and the immediately activated automatic response includes energy reduction interventions to avoid the new maximum peak.

23. The method of claim 16, wherein the automatic determination of whether at least one energy-relevant event is present comprises application of artificial intelligence.

24. The method of claim 23, wherein the artificial intelligence is selected from the group consisting of neural networks; rule-based expert systems; and goal-based planning systems.

25. The method of claim 16, wherein more obtained energy data is processed in a given time period than could be processed by a human being.

26. The method of claim 16, wherein the building system comprises at least two buildings.

27. The method of claim 16, including machine-based learning from the obtained data and/or machined-based constructing a model from the obtained data.

28. The method of claim 16, wherein the building system includes a building or buildings selected from the group consisting of at least one university building; at least one hotel building; at least one hospital building; at least one car dealership building; at least one shopping mall; at lease one government building; at least one chemical processing plant; at least one manufacturing facility; and any combination thereof of buildings.

29. The method of claim 16, wherein at two least buildings are under management and are geographically dispersed.

30. The method of claim 16, wherein a human operator is not needed.

31. The method of claim 16, wherein the building system includes at least two buildings and the at least two buildings are commonly owned or not commonly owned.

32. The method of claim 16, including automatic documentation of energy savings attributable to any said automatic intervention(s).

33. The method of claim 16, including machine-based reasoning to select between at least two conflicting goals.

34. The method of claim 33, wherein the machine-based reasoning is to select between a market price goal and a comfort-maintenance goal.

35. The method of claim 16, including a computerized display of energy data and/or device.

36. The method of claim 16, including, on human demand, computerized forecasting; computerized simulation of an effect or effects of a proposed control action; and/or computerized reporting on simulation at various levels of aggregation.

37. The method of claim 36, wherein the aggregation level for the computerized reporting is at an individual device, at everything in a building, at a set of buildings, or everything commonly owned.

38. A computer-based energy management system, comprising:

(A) non-human, computerized processing of obtained energy data, wherein the obtained energy data is for at least one energy user in a building system, said processing including automatic determination of whether at least one energy-relevant event is present; and

(B) upon recognition of an automatic determination that at least one energy-relevant event, a non-human, computerized response thereto based upon artificial intelligence reasoning.

39. The system of claim 38, wherein the non-human, computerized response is formulated after processing of more information than could be accomplished by a human in whatever processing time has been expended.

40. The system of claim 38, including artificial intelligence reasoning based on one or more of: (A) knowledge about a building or buildings in the building system; (B) knowledge about an energy using device; (C) knowledge about the building system; and (D) data outside the building system.

41. The system of claim 38, including automatic querying of energy users.

42. The system of claim 41, including receiving responses from queried energy users and automatically processing the received responses.

43. The system of claim 42, including automatic formulation of an optimal energy-saving command decision and/or strategy.

44. The system of claim 43, including executing the optimal energy-saving command decision or strategy.

45. The system of claim 44, wherein the optimal energy-saving command decision comprises a rotation of energy curtailment that minimizes impact over energy users in the system.

46. The system of claim 38, wherein the computerized response includes at least one determination based on one or more of: (A) air quality, humidity, pollutants, air flow speed, temperature, and other descriptors of physical properties of air; (B) light direction, light color, ambient temperature, foot candle, kw consumption of light producing equipment, smell of light, and other descriptors of physical properties of light; (C) plug load; motion sensed by motion sensors; carbon dioxide levels; brightness; sound levels; automated device for sensing human presence; motion detectors; light-sensing apparatus; habitation-sensor; (D) chemical or biological warfare agent sensing device.

47. The system of claim 46, wherein the chemical or biological warfare agent sensing device is selected from the group consisting of a mustard gas sensor, an anthrax sensor, a carbon monoxide sensor, a carbon dioxide sensor, a chlorine gas sensor and a nerve gas sensor.

48. The system of claim 38, wherein the artificial intelligence reasoning comprises at least one artificial intelligent agent and at any given time, what the artificial intelligence agent is doing may be monitored.

49. The system of claim 47, including monitoring is by a human viewing what the artificial intelligence agent is doing.

50. The system of claim 47, including generation of a log of historical activity by one or more artificial intelligent agents performing the artificial intelligence reasoning.

51. The system of claim 38, including machine-based detection of presence of a chemical or biological warfare agent, to which a machine-based response is determined.

52. The system of claim 48, wherein the machine-based response includes release of an anti-agent and/or adjustment of one or more energy users.

53. The system of claim 38, including at least one machine-based determination of at least one parameter of interest to a building manager, said parameter being measurable and controllable.

54. The system of claim 38, including automatic monitoring of the computerized response.

55. The system of claim 38, including communication over the Internet.

56. The system of claim 38, wherein a human operator may enter a query.

57. The system of claim 56, wherein the human operator query is a query as to current state of one or more devices in a specified building.

58. The system of claim 56, wherein the human operator query is a query requesting a prediction of effect of proposed control action(s) on an energy bill and/or on comfort.

59. A computer-based round-robin rotation system for energy users, wherein the energy users are under computer-based control and are present in a building system, the round-robin rotation system comprising

a series of computer-based energy curtailment commands to each of a plurality of energy users in the building system, wherein

(1) each computer-based energy curtailment command in the series of energy curtailment commands

(a) is specific to the energy user to which the curtailment command is directed;

(b) has been derived from an energy curtailment offer provided by the energy user; and/or

(c) is based on continually learned and observed characteristics of the energy user; and/or

(2) an energy user in the plurality of energy users is grouped with other energy users based on similarity with regard to a certain parameter or parameters.

60. The round-robin rotation system of claim 59, wherein the building system includes at least two buildings.

61. The round-robin rotation system of claim 59, wherein the round-robin system is formulated in response to a human request for energy curtailment.

62. The round-robin rotation system of claim 59, wherein the round-robin system is implemented under business-as-usual circumstances.

63. The round-robin rotation system of claim 62, wherein the system has learned by artificial intelligence that a desired target parameter in each area served by the system can be maintained by a round-robin rotation.

64. The round-robin rotation system of claim 63, wherein the target parameter is room temperature.

65. A computer based method of avoiding a new energy peak, comprising:

priming a computer-based system with data as to energy peak(s) already reached in a building system;

for current energy usage in the building system, obtaining, in real-time, computer-readable data from which to automatically forecast if a new energy peak is approaching; and

real-time automatic processing the obtained computer-readable data to forecast whether or not a new energy peak is approaching.

66. The computer-based method of avoiding a new energy peak of claim 65, wherein the building system comprises at least two buildings.

67. The computer-based method of claim 66, including compiling a complete array of historical data in computer-readable form, determining one or more patterns thereform, and comparing therewith current real-time data to forecast if a new peak is going to be reached.

68. The computer-based method of claim 66, including neural network based prediction.

69. The method of claim 65, wherein, if the real-time automatic processing of the obtained computer-readable data provides a forecast that a new energy peak is approaching, initiating an immediate, real-time, automatic response.

70. The method of claim 69, wherein no human operator intervention is involved in either the automatic processing to forecast whether or not a new energy peak is approaching nor the immediate, real-time, automatic response to the forecast that a new energy peak is approaching.

71. The method of claim 69, wherein the computer-readable data from which to automatically forecast if a new energy peak is approaching comprises data from the energy users in the building system.

72. The method of claim 69, wherein the computer-readable data is from a source selected from the group consisting of sensing devices; electric meters used for billing; and information from individual devices.

73. The method of claim 69, wherein demand for each individual device is forecast based on temperature forecasts; patterns historically observed and learned via artificial intelligence and under continual update; and occupancy where the individual device is provided.

74. An energy curtailment system comprising

an automatically managed round-robin rotation of a plurality of energy curtailment interventions.

75. The energy curtailment system of claim 74, wherein each respective energy curtailment intervention within the plurality of energy curtailment interventions is derived from an energy curtailment offer from a to-be-curtailed energy user.

76. The energy curtailment system of claim 75, including a plurality of to-be-curtailed energy users in a multi-building system.

77. The energy curtailment system of claim 76, wherein the multi-building system includes buildings geographically dispersed at least a state's distance apart.

78. The energy curtailment system of claim 75, wherein new energy peaks are avoided without human operator intervention.

79. The energy curtailment system of claim 75, wherein automatic documentation is automatically generated of avoidance of a new energy peak, with said automatic documentation being (a) stored in an accessible computer file and/or (b) printed and/or stored in a human operator-friendly format.

80. The energy management system of claim 1, wherein monthly energy consumption is reduced for the building system and/or peak load demand charges for the building system are lowered.

81. The energy management system of claim 1, including one revenue-grade virtual meter which is an aggregation of revenue-grade meters.

82. The energy management system of claim 1, wherein energy use is constantly monitored and/or adjusted, said constant monitoring and/or adjustment being non-human, wherein business-as-usual constant adjustment, 24x7 load reduction is provided.

83. The energy management system of claim 82, wherein the non-human constant monitoring and/or adjustment is by artificial intelligence.

84. The energy management system of claim 82, wherein the non-human constant monitoring and/or adjustment is to monitor and/or adjust at least one factor that influences energy consumption.

85. The energy management system of claim 84, wherein the at least one factor that influences energy consumption is selected from the group consisting of current weather conditions at and/or approaching an energy-user; occupancy levels of a facility served by an energy-user; market price of energy; weather forecasts; market price forecasts; air quality; air quality forecasts; lighting quality; lighting quality forecasts; plug load patterns; and plug load pattern forecasts.

86. The energy management system of claim 85, including monitoring and adjusting based on all of current weather conditions at and/or approaching an energy-user; occupancy levels of a facility served by an energy-user; market price of energy; weather forecasts; market price forecasts; air quality; air quality forecasts; lighting quality; lighting quality forecasts; plug load patterns; and plug load pattern forecasts.

87. The energy management system of claim 1, wherein the adverse energy event being monitored-for is at least one recognizable pattern of data that has been learned via artificial intelligence by a computer system doing the monitoring.

88. The energy management system of claim 87, wherein the computer doing the recognition of an adverse energy event, for each recognized pattern of data that is an adverse energy event, reacts with an automatic response based upon reasoning.

89. The system of claim 88, wherein the reasoning-based response is a querying response to be executed.

90. The energy management system of claim 1, wherein responses from queried energy users with energy curtailment possibilities are automatically processed by a computer with a set of instructions for evaluating how to enact each respective curtailment possibility of each respective energy user offering a curtailment possibility.

91. The energy management system of claim 90, wherein the computer automatically processing the responses from queried users totals the respective curtailment possibilities from the queried energy users amounts, determines whether the total of respective curtailment possibilities is sufficiently large, and, if so, proceeds to schedule a round-robin energy curtailment rotation pursuant to criteria.

92. The energy management system of claim 90, wherein the computer automatically processing the responses from queried users totals the respective curtailment possibilities from the queried energy users amounts, determines whether the total of respective curtailment possibilities is sufficiently large, and, if not, notifies a human user.

93. The energy management system of claim 1, including a preliminary step of functional testing for obtaining data and formulating applicable rules, and a continuous process of learning embedded in a neural net of a modeling agent associated with an energy-using device.

94. A compilation of energy-relevant data, comprising: a stream of energy-related data for at least one individual energy user within a plurality of energy users.

95. The compilation of claim 94, wherein the at least one individual energy user is within a multi-building system wherein separate streams of data are provided for other individual energy users within the multi-building system.

96. A data analysis method, comprising leveraging a stream of energy-related data for at least one individual energy user within a plurality of energy users, wherein the leveraging includes a comparison against historic data for the device.

97. The data analysis method of claim 96, wherein the leveraging includes computer-based searching for rapid deviation from a historic pattern.

98. A method of determining whether to repair or replace an individual energy user, comprising:

reviewing a stream of energy-related data for the individual energy user, wherein the individual energy user is contained within a plurality of energy users.

99. The method of claim 98, wherein the plurality of energy users are contained within a multi-building system.

100. An energy management system for automatically achieving energy curtailment in a multi-building system, comprising:

immediate automatic querying of energy users within the building system for energy curtailment possibilities;

automatic receipt of responses from queried energy users with energy curtailment possibilities;

automatic processing of energy curtailment possibilities into a round-robin curtailment rotation.

101. The energy management system of claim 100, wherein the immediate automatic querying is directly or indirectly activated based on a request by a local independent system operator, a power authority or a utility supplier.

102. The energy management system of claim 100, wherein the round-robin curtailment rotation is executed and achieves energy consumption reduction.

103. The energy management system of claim 102, wherein the energy consumption reduction occurs during an energy emergency.

104. The energy management system of claim 103, wherein the energy emergency is declared by a local independent system operator, a power authority, a utility supplier, or a governmental authority.

105. The energy management system of claim 100, wherein no human is controlling.

106. The energy management system of claim 100, wherein the round-robin curtailment rotation has been called in order that energy may be sold back into the grid.

107. The energy management system of claim 100, wherein maximum energy curtailment is achieved with minimal impact to occupants of buildings in the building system.

108. The energy management system of claim 100, wherein maximum energy curtailment is achieved with no greater than a certain defined level of impact to occupants of buildings in the building system.

109. The energy management system of claim 100, wherein the multi-building system is owned by an owner selected from the group consisting of a commercial entity, a university and a government.

110. The system of claim 1, wherein each energy user has associated therewith a dedicated neural network that continuously learns operating characteristics of said energy user associated with the dedicated neural network, wherein forward and backward reasoning and forecastability are provided.

111. The system of claim 1, including at least one modeling agent and/or at least one forecasting agent.

112. The system of claim 1, wherein the system is autonomous, artificial-intelligence based, real-time, over the Internet.